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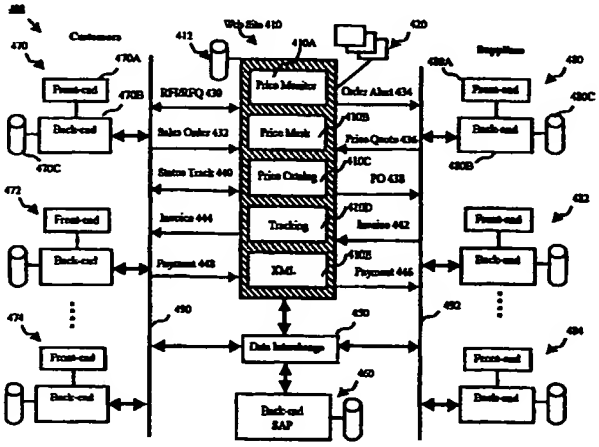
(54) Title: NETWORK-BASED VIRTUAL COMMODITY EXCHANGE



(57) Abstract: A method, apparatus and computer program product for virtual trading of a commodity between business entities using the Internet, an Intranet, or an Extranet (340) are disclosed. A trading center (400) receives a sale order for the commodity from a customer system (470) using eXtensible Style Language (XSL) and/or the eXtensible Markup Language (XML) (410E). The trading center (400) includes a web server (330), a back-end processing system (310), and storage media. The trading center (400) sources (434-436) a supplier system (480-484) of the commodity from several supplier systems (480-484) dependent upon information made available using XML (410E). The customer and supplier systems (470-474, 480-484) each include a front end processing system (470A, 480A), a back end processing system (470B, 480B), and storage media (470C, 480C). A commodity purchase transaction (438, 442, 446) is committed via the network (492) from the trading center (400) to the supplier system (480-484) using XML (410E). A commodity sale transaction (444, 448) is then committed via the network (490) from the trading center (400) to the customer system (470-474) using XML (410E).

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NETWORK-BASED VIRTUAL COMMODITY EXCHANGE

FIELD OF THE INVENTION

The present invention relates to a commodity exchange system and particularly to a virtual commodity exchange for online networks, such as the World Wide Web (WWW) portion of the Internet and similar networks.

BACKGROUND

The proliferation of the Internet and Internet-based technology has occurred in recent years in an unprecedented manner. Large segments of the public around the world regularly make use of the Internet in their daily activities. Many businesses also use the Internet in relation to their commercial activities. It is expected that this is a trend that will experience significant growth in the coming years. Already in the latter part of the 1990s, there has been increasing interest in the Internet as a platform for electronic commerce (e-commerce), permitting access to expanding numbers of buyers and sellers, both locally and internationally. This has occurred at the same time as the volume of electronic trading has grown significantly. The array of products and services offered via the Internet is extensive, including banking services, online bookstores, advertising, and direct selling of many products and services to name a few.

Currently, most commodity purchasing utilizing the Internet or World Wide Web can be grouped into one of three general classes of transactions: "Rep Sales", "Store-Front", and "Electronic Catalog". The Sales-Representative ("Sales Rep") paradigm describes a class of transactions that relies heavily on person-to-person contact to "hand hold" the parties through the transaction process. This paradigm provides a high degree of end-to-end continuity, but is inefficient, expensive, and difficult to expand. It involves a low level of digitalization. Standardized processes can be used to ensure some level of uniformity in the service, but the success of this model relies heavily on the personality and competence of each individual.

The Internet Catalog paradigm describes another class of transactions that has a heavier dependence on technology than the "Sales

Rep" paradigm, but provides low end-to-end integration of the entire purchasing support process. For a business-to-consumer model, Internet catalogs provide a degree of end-to-end integration, but for a business-to-business model no system is known to provide end-to-end integration of the entire purchasing process. Therefore, this class of transaction processing has not been widely utilized for production procurement activities.

The Store Sale paradigm is a class of purchasing transactions in which there is a combination of both high reliance on physical contact and a low level of end-to-end integration. The most common example is sales through a store or conventional catalog.

U.S. Patent No. 5,897,622, which issued to Blinn et al on 27 April 1999, relates to an electronic shopping and merchandising system. In particular, a merchant system for online shopping and merchandising is described. The merchant system includes a dynamic page generator, a configurable order processing module, and a database module capable of retrieving data from a database without regard to the schema of the database. The database module and the dynamic page generator allow merchants to modify their databases and page displays without having to re-engineer the merchant system.

US Patent No. 5,878,419, which issued to Carter on 2 March 1999, describes a method of creating and using a relational description of a formatted transaction while maintaining a data element context. The formatted transaction can be in electronic data interchange (EDI) format or another structured transaction format. A computer receiving the formatted transaction generates or is provided with a set of assignments of unique persistent tags to all possible data element contexts that are of interest. As the transaction is being parsed, each of the transaction's data elements is tagged with an appropriate, unique, persistent tag that identifies its context. Each data element is then written to a field in a relation in which the column name of the field matches the unique, persistent tag. Data elements that can occur only once in a transaction are written to a root relation, while data elements that can occur multiple times are written into a sub-relation.

However, neither of the foregoing US patents teaches or even suggests facilities for finding and qualifying potential trading partners.

Still further each of them fails to teach or even suggest a method for allowing virtual direct contact between buyers and sellers for the duration of a transaction. Still further, conventional systems only automate part of an entire purchasing life cycle.

SUMMARY

In accordance with a first aspect of the invention, a method of virtual trading of a commodity between business entities using one or more networks is disclosed. Preferably, the network is the Internet, an Intranet, an Extranet, or other like network. In the method, a trading entity receives via a network a sale order for the commodity from a customer entity using a data interchange medium. Preferably, the data interchange medium includes using the eXtensible Markup Language (XML). Alternatively, the data interchange medium may use the eXtensible Markup Language with the Electronic Data Interchange (EDI) format. The trading entity sources a supplier entity of the commodity from a plurality of supplier entities via the network dependent upon information made available on the network to the trading entity using the data interchange medium. A purchase transaction of the commodity is committed via the network from the trading entity to the supplier entity using the data interchange medium. A sale transaction of the commodity is then committed via the network from the trading entity to the customer entity using the data interchange medium.

The customer entity and each of the supplier entities include a front end processing system, a back end processing system, and storage media. The front-end system may include a web server and an application server. The back end processing system may include an Enterprise Resource Planning (ERP) system and/or other legacy system. More preferably, the trading entity includes a web application server, a back-end processing system, and storage media. The data interchange medium interfaces between the web server and the back-end processing system. Again, the back end processing system may include an ERP system.

Preferably, the method involves the trading entity automatically monitoring information about the commodity from one or more sources via the network using the data interchange medium. The method may also involve the trading entity generating a commodity database containing information about the commodity derived from the one or more sources using

the data interchange medium. Further, the method may involve the step of analyzing the commodity database to recommend the supplier entity as the source of the commodity from amongst the supplier entities. Optionally, the trading entity may generate a monitoring alert dependent upon the commodity database.

The method may further include the step of tracking the status of the sale order in response to a query of the customer entity via the data interchange medium.

The sourcing step further includes the step of issuing an order alert from the trading entity to the supplier entities via the network using the data interchange medium to solicit the information about the commodity from the supplier entities. Still further, the sourcing step may include the steps of issuing a monitor alert by the trading entity recommending the supplier entity dependent upon the information about the commodity; and selecting the supplier entity to source the commodity in response to user input at the trading entity.

The purchase transaction committing step further includes the step of sending a purchase order from the trading entity to the supplier entity sourcing the commodity via the network using the data interchange medium. The purchase order is generated by a back-end processing system of the trading entity. Further, the purchase transaction committing step may include the step of issuing a confirmation of order fulfillment from the supplier entity to the trading entity via the network using the data interchange medium in response to the purchase order from the trading entity. The purchase transaction committing step may further include the step of effecting payment from the trading entity to the supplier entity in response to the confirmation of order fulfillment.

The sale-transaction-committing step further includes the step of issuing a confirmation of order fulfillment from the trading entity to the customer entity via the network using the data interchange medium. The sale-transaction-committing step further may also include the step of receiving payment at the trading entity from the customer entity in response to the confirmation of order fulfillment.

Preferably, the method includes the step of providing a catalog of the commodity by the trading entity via the network.

In accordance with a second aspect of the invention, an apparatus for virtual trading of a commodity between business entities using one or more networks is disclosed. The apparatus includes a receiving device, a sourcing device, a purchase-transaction-committing device, and a sale-transaction-committing device. The receiving device receives a sale order for the commodity via a network at a trading entity from a customer entity using a data interchange medium. The sourcing device sources a supplier entity of the commodity means via the network by the trading entity from a plurality of supplier entities dependent upon information made available on the network to the trading entity using the data interchange medium. The purchase-transaction-committing device commits a purchase transaction of the commodity via the network from the trading entity to the supplier entity using the data interchange medium. The sale-transaction-committing device commits a sale transaction of the commodity via the network from the trading entity to the customer entity using the data interchange medium.

In accordance with a third aspect of the invention, a computer program product is disclosed having a computer readable medium having a computer program recorded therein for virtual trading of a commodity between business entities using one or more networks. The computer program product includes a computer readable program code receiving module, a computer readable program code sourcing module, a computer readable program code purchase-transaction-committing module, and a computer readable program code sale-transaction-committing module. The computer readable program code module for receiving receives a sale order for the commodity via a network at a trading entity from a customer entity using a data interchange medium. The computer readable program code sourcing module sources a supplier entity of the commodity via the network by the trading entity from a plurality of supplier entities dependent upon information made available on the network to the trading entity using the data interchange medium. The computer readable program code purchase-transaction-committing module commits a purchase transaction of the commodity via the network from the trading entity to the supplier entity using the data interchange medium. The computer readable program code sale-transaction-committing module commits a sale transaction of the commodity via the network from the trading entity to the customer entity using the data interchange medium.

In accordance with a fourth aspect of the invention, a method is disclosed for trading commodities using a network. In the method, information about a commodity is automatically extracted from remote sources via the network using a data interchange medium. Information about the commodity for a transaction is derived based on the extracted information. The derived information about the commodity is provided to enable the transaction regarding the commodity. Preferably, the data interchange medium is the eXtensible Markup Language (XML).

The extracting step may include the steps of accepting a network-based information query and mapping the network-based information query into a query recognized by a back office transaction system using the data interchange medium. More preferably, the deriving step includes the steps of: providing a database; obtaining information from remote sources that support the data interchange medium using an access engine capable of reading and storing information in the database; and determining trends and/or events from the obtained information using a decision support engine capable of reading and storing information in the database.

The method may also include the step of presenting data obtained in the determining step to a trader or a customer. Still further, method may include the step of alerting a trader or a trader about information concerning the commodity. Data for exchange to a buyer and/or a seller via the network utilizing the data interchange medium may be rendered.

In accordance with a fifth aspect of the invention, an apparatus for trading commodities using a network is disclosed. The apparatus includes: a device for automatically extracting information about a commodity from remote sources via the network; a decision support device for deriving information about the commodity for a transaction based on the extracted information; and a device for providing information about the commodity to enable the transaction regarding the commodity.

In accordance with a sixth aspect of the invention, a computer program product having a computer usable medium having a computer readable program code means embodied therein for trading commodities using a network is disclosed. The computer program product includes: a computer readable program code module for automatically extracting information about a commodity from remote sources via the network; a computer readable

program code module for deriving information about the commodity for a transaction based on the extracted information; and a computer readable program code module for providing derived information about the commodity to enable the transaction regarding the commodity.

In accordance with a seventh aspect of the invention, a method of trading a commodity via one or more networks is disclosed. The method includes the steps of: providing a web server accessible to the one or more networks, the web server utilizing a data interchange medium, the web server also being capable of extracting information about a commodity from remote sources via the network using the data interchange medium and deriving information about the commodity based on the extracted information; receiving a sales order for the commodity from a customer via the network using the data interchange medium; issuing an order alert to one or more suppliers of the commodity via the network using the data interchange medium; receiving one or more price quotes from at least one of the suppliers, respectively, via the network using the data interchange medium; selecting a supplier from the suppliers based on the one or more price quotes and derived information about the commodity; placing a purchase order for the commodity to the selected supplier via the network using the data interchange medium; receiving confirmation of the purchase order being accepted by the selected supplier via the network using the data interchange medium; placing a confirmation of order fulfillment for the commodity to the customer via the network using the data interchange medium; and receiving acknowledgement of acceptance by the customer via the network using the data interchange medium.

In accordance with a eighth aspect of the invention, an apparatus of trading a commodity via one or more networks is disclosed. The apparatus includes: a web server accessible to the one or more networks, the web server utilizing a data interchange medium, the web server having means for extracting information about a commodity from remote sources via the network using the data interchange medium and means for deriving information about the commodity based on the extracted information; a device for receiving a sales order for the commodity from a customer via the network using the data interchange medium; a device for issuing an order alert to one or more suppliers of the commodity via the network using the data interchange medium; a device for receiving one or more price quotes from at least one of the suppliers, respectively, via the network using the data interchange medium; a device for selecting a

supplier from the suppliers based on the one or more price quotes and derived information about the commodity; a device for placing a purchase order for the commodity to the selected supplier via the network using the data interchange medium; a device for receiving confirmation of the purchase order being accepted by the selected supplier via the network using the data interchange medium; a device for placing a confirmation of order fulfillment for the commodity to the customer via the network using the data interchange medium; and a device for receiving acknowledgement of acceptance by the customer via the network using the data interchange medium.

In accordance with a ninth aspect of the invention, a computer program product having a computer usable medium having a computer readable program code means embodied therein for trading a commodity via one or more networks is disclosed. The computer program product includes: a computer readable program code module for providing a web server accessible to the one or more networks, the web server utilizing a data interchange medium, the web server having means for extracting information about a commodity from remote sources via the network using the data interchange medium and means for deriving information about the commodity based on the extracted information; a computer readable program code module for receiving a sales order for the commodity from a customer via the network using the data interchange medium; a computer readable program code module for issuing an order alert to one or more suppliers of the commodity via the network using the data interchange medium; a computer readable program code module for receiving one or more price quotes from at least one of the suppliers, respectively, via the network using the data interchange medium; a computer readable program code module for selecting a supplier from the suppliers based on the one or more price quotes and derived information about the commodity; a computer readable program code module for placing a purchase order for the commodity to the selected supplier via the network using the data interchange medium; a computer readable program code module for receiving confirmation of the purchase order being accepted by the selected supplier via the network using the data interchange medium; a computer readable program code module for placing a confirmation of order fulfillment for the commodity to the customer via the network using the data interchange medium; and a computer readable program code module for receiving acknowledgement of acceptance by the customer via the network using the data interchange medium.

BRIEF DESCRIPTION OF THE DRAWINGS

A small number of embodiments of the invention are described hereinafter with reference to the drawings, in which:

Fig. 1 is a diagram illustrating characteristics of a virtual commodity exchange in accordance with the embodiments in relation to other paradigms;

Fig. 2 is a diagram depicting the end-to-end integration of the virtual commodity exchange in accordance with the embodiments of the invention;

Fig. 3 is a block diagram of a system implementing the virtual commodity exchange in accordance with a first embodiment of the invention;

Fig. 4 is a block diagram of the virtual commodity exchange in accordance with the first embodiment of the invention;

Fig. 5 is a diagram depicting a screenshot of a commodity-trading monitor for the example of electronic memory in accordance with the virtual commodity exchange of Fig. 4;

Fig. 6 is a block diagram illustrating the use of XML and XSL in accordance with a second embodiment; and

Fig. 7 is a block diagram of a decision support module 330C of Fig. 3.

DETAILED DESCRIPTION

A method, an apparatus, a computer program product and a system for providing a virtual environment to buy, sell, and/or trade commodities over the World-Wide Web (WWW) are described. In the following description, numerous details are set forth including specific query engines, web rendering techniques, and the like, for example. It will be apparent to one skilled in the art, however, that the present invention may be practiced without these specific details. In other instances, well-known features are not described in detail so as not to obscure the present invention.

For ease of description, the embodiments of the invention are each described or referred to as a "system". Components of the system are described as modules. A module, and in particular the module's functionality, can be implemented in either hardware or software. In the software sense, a module is a process, program, or portion thereof, that usually performs a particular function or related functions. In the hardware sense, a module is a functional hardware unit designed for use with other components or modules. For example, a module may be implemented using discrete electronic components, or it can form a portion of an entire electronic circuit such as an Application Specific Integrated Circuit (ASIC). Numerous other possibilities exist. Those skilled in the art will appreciate that the system can also be implemented as a combination of hardware and software modules.

For convenience and ease of reference, the description includes the following sections:

I. Overview of Virtual Commodity Exchange
II. Key Issues Identified and Overcome by Embodiments
III. End-to-End Integration of Purchasing Life Cycle
IV. System Architecture of Virtual Commodity Exchange
V. Functional Modules of Virtual Commodity Exchange

I. Overview of Virtual Commodity Exchange

The system utilizes a new business model implemented using information technology to create a virtual environment to buy, sell, or trade commodities over the World Wide Web (WWW) of the Internet, an Intranet, an Extranet, or other like network. In particular, a set of existing and new e-commerce technologies have been brought together to create a "virtual commodity exchange". This system permits a person or an organization to (a) create a virtual cluster of buyers and sellers, (b) enable seamless end-to-end communication and business transactions, and (c) provide market information to commodity buyers harnessing the collective intelligence of the World Wide Web in a decision support tool. An Extranet (Extended Intranet) is an Intranet that is partially accessible to authorized parties outside an organization. While an Intranet resides behind a firewall and is accessible only to people who are members of the same company or organization, an Extranet provides various levels of accessibility to parties outside the company or

organization. An Extranet can only be accessed if a party has a valid username and password. The party's identity determines which parts of the Extranet that the party can view. Extranets are an increasingly popular means for business partners to exchange information.

The system of the embodiments represents a significant shift of the traditional, financial-transaction model from a "seller-centric" to "buyer-centric" purchasing model. Utilizing this business approach, classic commodity trading principles can be applied to non-exchange commodities. A person or an organization can perform the following tasks:

1) establish dynamically a virtual community of interested buyers and sellers, performing buy/sell transactions on a global scale (providing speed and flexibility);
2) capitalize on real-time fluctuations in prices, supply, and demand (thereby facilitating the lowest possible purchase cost); and
3) apply commodity-trading principles to non-exchange commodities to predict market movements (predictive cost modeling).

In addition to particular aspects of the business model, there are important technology underpinnings that make this model possible. Two technical elements important to this system are the eXtensible Markup Language (XML) as the data interchange standard for trading information and decision support analysis based on information derived from the WWW.

The system implemented in this embodiment is specifically targeted to enable trading of electronic components. However, both the business model and the system can be utilized to address the same business issues (and offer the same advantages) for the general case of trading any commodity in any of a number of situations. One such situation is where a party (either a single company or person) creates a "captive" trading environment, in which the party can electronically buy, sell, or trade commodities utilized internally through leverage of "public" sources (generally known to all), "proprietary" sources (special relationships negotiated between two parties), or "captive" sources (exclusive source from wholly-owned subsidiaries or divisions of a parent company). Another relevant situation is where a consortium of parties creates a "private" trading environment, in which the same three sources (public, proprietary, and captive) are made available to all parties with the group, but only to

the group. A further situation is where a trading company creates a "public" trading environment, in which commodities from public, proprietary, and captive sources are made available to any company or individual on the web. Still yet another situation is where a manufacturing company or group of companies creates a commodity "re-sale" structure, an anonymous environment to liquidate excess stock.

II. Key Issues Identified and Overcome by Embodiments

The buying, selling, and trading of commodities is a fundamental element of most business operations. The ultimate success (or failure) of many businesses is directly related to efficiency of the purchasing and/or sales organizations. Businesses today tap global sources and reach global markets to be successful. The requirement for global reach creates three main challenges that must be addressed to allow for efficiency improvements in these core business processes. The three key challenges or issues that the system attempts to overcome are: 1) buyer/seller identification and qualification; 2) seamless, cost-efficient communication; and 3) transaction data exchange.

The first challenge is to locate and qualify potential buyers and sellers on a global basis. Information on a broad range of issues (including cost, quality, capacity, distribution, taxes, and political stability) is considered in these decisions. The volatility and rate of change of today's global economic environment has rendered traditional methods of collecting and analyzing data ineffective. The World Wide Web has facilitated improvements in buyer/seller communication to some extent, but has so far been an inefficient resource for finding and qualifying buyers and sellers. This system directly addresses these issues by significantly increasing access to real-time, high-quality information about potential buyers and sellers.

The second challenge is bringing the buyer and seller together in a seamless, cost-efficient way to conduct negotiations and consummate the business transaction. Preferably, the buyer and seller are brought into direct (seamless) contact to allow accurate exchange of information associated with the transaction, but only for the time required to consummate the transaction (cost-efficient). No existing communication method meets this requirement across a global supplier and customer base. Even the World Wide Web as used currently cannot achieve this. Therefore,

traditional communication methods have attempted to balance the cost of direct contact against the quality of indirect contact. This balance is critical to efficiency, but both the cost of direct contact and the quality of indirect contact are both subjective in nature and difficult to maintain. The business model employed by the system according to the embodiments of the invention dramatically enhances the efficiency of indirect contact by creating a global, virtual environment for end-to-end for communication.

The third challenge is to facilitate appropriate data exchange that eliminates confusion, ensures complete data exchange, authenticates the identity of all parties, guarantees security and privacy, and meets legal requirements for documentation of the agreements. Tools and procedures are in place today to address some aspects of this challenge. However, no business transaction framework is known to exist currently that allows these tools and procedures to be brought together in an integrated manner and on a global scale. The business model of the system according to the embodiments provides such a framework and, for the first time, allows previously stand-alone business processes to be integrated seamlessly and globally.
This system of the embodiments of the invention allows businesses to efficiently access both global supplier and customer bases, thereby enabling dramatic increases in productivity.

To summarize, a virtual trading environment built around the World Wide Web in accordance with the embodiments of the invention directly addresses several key issues in today's business environment. Firstly, the embodiments of the invention facilitate global access to buyers and sellers. Secondly, the embodiments improve the ability of a business to find and qualify potential trading partners. Thirdly, the embodiments significantly enhance communication by allowing virtual direct contact between a buyer and a seller for the duration of the transaction. Fourthly, the embodiments ensure appropriate data exchange, i.e. a complete, authenticated, secure, private, and legally binding exchange of only the information required to consummate a transaction.

Thus, the embodiments of the invention produce business and technical advantages. The advantages of this virtual e-trading model include real-time access to the lowest possible cost for commodities, the ability to conduct an electronic auction, and provide a real-time

application of decision support tools to component purchasing process (makes buyers smarter and more responsive). Other advantages include linking seamlessly the total supply chain from component supplier to Electronic Card Assembly and Testing (ECAT) manufacturer, for example, and enabling real-time "pull" of pricing, availability, and technical information from supplier web sites.

III. End-to-End Integration of Purchasing Life Cycle

The electronic virtual-commodity-exchange system of the embodiments provides a unique capability for implementing real-time commodity trading. The underlining technologies include XML data templates, decision support logic, and SAP/EDI/XML communication linkage. Systems, Applications and Products in Data Processing (SAP) is an integrated software application that has a set of business application software modules for many large business functions including manufacturing, sales and distribution, human resources, and finance. Further, SAP can be implemented using mainframe and/or client/server technology. SAP provides user-role-based business scenarios integrating a company's or organization's strategic management of e-business opportunities, customer relationships, supply chains, logistics, manufacturing, financial, human resources and knowledge. Electronic Data Interchange (EDI) is a standard for electronic interchange of structured data between businesses. The combination of a new business process and e-commerce technologies enables competitive advantages in component cost (guarantee of getting the lowest possible cost), speed (react instantaneously to changes in market dynamics), and improvements in end-to-end communication.

Unlike the conventional transaction paradigms of "Store-Front", "Rep Sales", and "Electronic Catalog", the embodiments of the invention utilize a new transaction paradigm: the virtual commodity exchange. Fig. 1 depicts the relative relationships between this paradigm 110 and the noted conventional paradigms. The virtual commodity paradigm provides high levels of digitalization and end-to-end integration of data. The embodiments provide a business-to-business transaction process combining the advantages of digitalization (speed, cost, and efficiency) with the main advantages of end-to-end integration of the purchasing transaction. Also, the embodiments allow integration of the entire purchasing life cycle using state-of-the-art e-commerce technology, such as XML message

interchange, an interface between a web browser and a virtual trading hub or center, and on-line decision support.

To be effective, a fully integrated virtual purchasing or commodity-trading environment must address all steps in the purchasing life cycle. Without full end-to-end integration, the speed and flexibility required to support a commodity-trading model cannot be supported. Fig. 2 is a diagram depicting the end-to-end integration of the virtual commodity exchange in accordance with the embodiments of the invention. As shown, the steps in the purchasing life cycle, from beginning to end, are:

1) market intelligence (#) 210,
2) RFI / RFQ / RFP (*) 212,
3) negotiation (#) 214,
4) source selection (#) 216,
5) contract (+) 218,
6) catalog (+) 220,
7) requisition (+) 222,
8) approval (#) 224,
9) purchase order (P.O.) (*) 226,
10) delivery tracking (+) 228,
11) invoice (+) 230, and
12) payment (+) 232.

In Fig. 2, a "+" indicates a part of the purchasing life cycle that is the focus of traditional e-commerce, an "*" indicates a part that is fully automated in the virtual commodity exchange of the embodiments, and a "#" indicates a part that is automated with human supervision via the virtual commodity exchange of the embodiments.

Conventional e-commerce applications for Business-To-Business environments have focused on the purchase order cycle: purchase order / delivery tracking / invoice (see Fig. 2). These aspects of the transaction cycle have been handled by traditional EDI for several years. To date, most e-commerce attention has been placed on replacing EDI with a web-based alternative. For the Business-To-Consumer environment, the World Wide Web has facilitated automation of several elements of the process. However, to date, improvements in the purchasing life cycle process and technology have only been able to support automation of the

"down stream" elements of the process: essentially catalog to payment. Existing business models and technology has not been able to automate the entire purchasing life cycle. In contrast, the embodiments of the invention are able to do so and therefore support new business opportunities. Each of the process steps of the purchasing life cycle of Fig. 2 and how the steps are addressed by the embodiments of the invention are described hereinafter.

Market intelligence 210 is automated with human intervention in the embodiments of the invention. This step 210 involves gathering background information pertinent to a purchasing decision, analyzing that information, and presenting the results to a purchasing professional in a timely manner. That is, the right information is provided to the right people in the right format at the right time. Traditionally, this is a completely manual process involving little process discipline. Therefore, the results can be highly subjective and difficult to replicate from one organization to the next. The embodiments of the invention address both of these issues. The embodiments harness the collective intelligence of World Wide Web to provide the purchasing professional with a worldwide, real-time view of important trends. Process discipline and consistency are guaranteed.

The embodiments of the invention include an information gathering and analysis tool that extracts commodity information in real-time from the World Wide Web. Using a decision support engine based on Artificial Intelligence technology, software keeps buyers and traders informed of price trends and breaking events. The embodiments provide this capability for purchasing of commodities that are not bought and sold on a traditional trading floor of a commodity exchange.

The Request for Information, Request for Quote, and Request for Proposal (RFI / RFQ / RFP) step 212 represents three methods used by the purchasing professional to collect information about potential sources (costs, delivery, product specifications, and the like). This step traditionally involves labor-intensive activity requiring a lot of manual intervention to collect, tabulate, review, and document the purchasing decision. Alternatively, in the case of a supplier who is providing information for another organizations RFI / RFQ / RFP, the step involves labor-intensive activity to prepare submission packages. Since both are auditable activities, record retention and audit trails are essential.

Via direct access to the (SAP) back-office systems, the embodiments of the invention provide a set of tools to automate both responses to RFI / RFQ for components in the trading system and, more importantly, provide automatic evaluation of the sourcing options and recommendations to a purchasing agent. The embodiments of the invention automate this step, thereby reducing the amount of searching done by operators. The embodiments gather information from multiple web sites.

The Negotiation step 214 is automated with human supervision in the embodiments of the invention. Utilizing the direct data exchange capabilities of XML, the purchasing agent can quickly exchange information with potential suppliers to negotiate preferred options.

The Source Selection step 216 is also automated with human supervision in the embodiments of the invention. In the embodiments of the invention, decision support software recommends a final source selection to the purchasing professional. The software (a) collects market intelligence, (b) pulls RFI / RFQ information from qualified suppliers, (c) analyzes critical decision factors (e.g., price, quantity, availability, specifications, quality), and (d) recommends a preferred option to the purchasing agent for final approval.

The Contract step 218 is carried out using standard contract structures. The contracts can be automatically created and transmitted to the supplier. In any given instance, this step can be eliminated through the use of blanket agreements. Contracts are typically of two types: static and dynamic. Static contracts are often provided online via an interface that grabs data. An example is an agreement provided via a browser requiring a user to agree to the terms of a software license before the user is permitted to download software from a web site. A dynamic contract is able to automatically generate a customized contract with different terms and conditions based on a customer profile, volume purchase, delivery date, and similar information.

In the Catalog step 220, electronic catalogs can easily be maintained in a part catalog database and linked to a back end system, such as an SAP, for on-line retrieval by a front end system, such as a web server.

The Requisition / Approval steps 222, 224 are business controls processes that involve requests to commit funds and associated approvals (internal to an organization) to ensure there is proper management oversight of the financial transaction. In the embodiments of the invention, the Approval step 224 is automated with human supervision. These two processes can be created by configuring and programming the back-end (SAP) system to link the catalog and provide work flow control for requisition and approval.

The purchasing life cycle also involves a purchase order (PO) step 226 that is fully automated in the embodiments of the invention. Electronic purchase orders exist in industry. However, in the embodiments via XML, the PO can be placed electronically without using EDI (Electronic Data Interchange) and the associated value added network (VAN). Thus, the embodiments of the invention provide significant cost savings and a universal interface to any business connected to the World Wide Web.

The Delivery Tracking step 228 of the embodiments of the invention allows for web-page querying of a back-office transaction processing system to check order and payment status.

The Invoice step 230 in accordance with the embodiments of the invention utilizes XML, which allows, as with the purchase order, the invoice to be transmitted electronically from a supplier that can connect to the World Wide Web and send back the request.

The Payment step 232 in accordance with the embodiments of the invention is implement using a back office payment system to complete the final element of the end-to-end integration process.

IV. System Architecture of Virtual Commodity Exchange

The system architecture 300 for implementing the virtual commodity exchange in accordance with a first embodiment of the invention is depicted in Fig. 3. The system has four elements: one or more back-office transaction processing systems 310, a data interchange medium 320, a web application server 330 (or simply web server hereinafter), and customer and/or supplier systems 350, 352.

The overall system architecture allows essentially any back-office transaction system 310 to be incorporated into the system and support the full functionality of the back-office transaction system. The back-office transaction system can be a back-end commercial transaction system 310A, an SAP 310C, and/or another legacy system 310B.

Data interchange medium 320 is a common data interchange medium shown schematically between the web server 330 and the back-office transaction processing systems 310. The data interchange medium 320 may be implemented using XML, or XML with compliance to the existing standardized electronic data interchange (EDI) format. Utilization of XML data exchange constructs allows information from the web server 330 to be mapped and transmitted seamlessly to the back-office systems 310. The data interchange medium 320 creates a "gateway" into the back-office through a standardized interface. This element may not be needed when all entities understand XML format for data interchange.

The web server 330 connected to the Internet, Intranet, Extranet, or other like network 340 is the "command center" of the virtual commodity exchange 330. The server 330 includes the following functional modules: a back office interface module 330A, a query engine module 330B, a decision support module 330C, and a web-rendering module 330D.

The back office interface module 330A is implemented using XML over the Internet, Intranet, Extranet, or a like network to communicate with the back office systems.

The query engine module 330B accepts web-based information queries and maps the queries (via XML) into a command structure recognized by the back office system. To follow up on on-going activities during trading, both buyers and sellers can make XML queries to the database of the web server 330 for status tracking and updates. The XML query can preferably issue automatically from a customer's system without human intervention. Further, the web server 330 allows customers to raise a request for information (RFI) and a request for quote (RFQ) to query the database. All such requests can be automatically processed through XML queries between the systems 350, 352 of customers and suppliers by server to server data interchange.

The decision support module 330C (identified by reference numeral 700 in Fig. 7) includes four elements: an XML-based web access engine 710, a database 720, an Artificial Intelligence (AI) based decision support engine 730, and a data rendering and alert tool 740. The data rendering and alert tool 740 includes a data rendering module 740A, an on-demand display module 740B, and an on-line alert module 740C. The XML-based access engine 710 receives input from network locations and provides output to the AI-decision support engine 730. Both the XML-based access engine 710 and the AI decision support engine 730 are coupled to a database (DB) 720, so that data can be read from and written to the database 720. The AI decision-support engine 730 is coupled to the data rendering and alert module 740. The data rendering module 740A of the data rendering and alert module 740 receives input from the AI decision support engine 730. In turn, the data rendering module 740A provides output to both the on-demand display module 740B and the on-line alert module 740C.

The XML-based access engine 710 "pulls" information from public and proprietary sources that support XML data interchange format. The database 720 holds XML-based search results from the public and proprietary sources. Preferably, the database 720 is a historical commodity database serving as a repository of relevant information pertaining to a particular commodity populated by three main sources: information dynamically pulled from the web utilizing XML, proprietary information collected by internal commodity experts via traditional intelligence gathering techniques, and importantly by automatic, historical analysis of previous predictions against actual historical events. This functionality is preferably implemented using Java applets that "pull" information from information sources provided via the Internet, Intranet, Extranet, or a like network.

The AI-based decision support engine 730 based on the decision processes used by existing "content experts" (i.e., professional buyers for each commodity with the highest successful purchasing record) to extract important trends and events from the data repository 720 (i.e., the database). Preferably, the AI-based decision support engine is an expert decision support matrix built utilizing conventional AI methods well known to those skilled in the art. The engine is built based on a combination of traditional commodity trading algorithms and extensive analysis of the decision processes used by existing "content experts"

(i.e., professional buyers for each commodity with the highest successful purchasing record). Entries in the historical commodity database are time stamped. Testing historical predictions against historical events can be used to validate the accuracy of the AI decision support matrix.

The data rendering and alert tool 740 tabulates and displays important trend and other decision results in a graphical format on-line 740B or on demand 740C. The data rendering and alert tool or module 740 forms part of the decision support (software) module and is a data rendering tool for extracting, formatting, and presenting real-time information to commodity traders. Based on the AI-based decision support engine 730, the data rendering and alert module 740 provides prompts to the commodity traders. Such prompts include: (1) highlighting the current key indicators to watch, (2) recommending specific actions when a buy / sell transaction is to be performed, and (3) triggering alerts to a buyer's desktop when predetermined trigger conditions occur.

Fig. 5 is a graphical depiction of a screenshot 500 of a trading monitor for memory (i.e., the commodity) generated by the data rendering and alert module. The particular monitor alert 500 is for memory, but the monitor alert 500 can be readily practiced with other commodities. The trading monitor 500 preferably has five key regions 510, 520, 530, 540, and 550. A memory news portion 510 provides extracts of information about relevant events pertaining to the commodity (unread items are indicated by underlining). To alert a trader to a particular item in the memory news portion 510, a star is placed beside the item. A first graph 530 depicts the supply and demand of four types of memory. The entry for FMP SOJ 4X4 is denoted with a star in the graph, because supply exceeds demand for this type of memory in relation to the three other types. A second graph 530 depicts EDO SOJ 4X4 prices. The graph 530 plots a contract price (solid line), a spot price (long dashed line), and a source 1 price (short dashed line). The stars shown in the graph indicate information to be alerted to the user (using the data rendering and alert module 740 of Fig. 7). The trading monitor 500 also contains a memory price table for SOJ 4X4. A contract entry, a spot entry, and a source 1 entry are listed. Under the contract entry, the prices of three suppliers (Sup A, Sup B, and Sup C) and the respective weekly capacity are listed. Similar information is provided for the spot and source 1 entries. Finally, an alert field 550 prompts a trader with the following information: "Price increase in SOJ 4X4 projected, lock volumes at contract price."

Referring again to Fig. 3, the decision support module 330C has several advantageous aspects. Firstly, the module 330C utilizes XML to pull real-time information from the World Wide Web to combine the real-time information with traditional data sources for decision support analysis. Secondly, the module 330C applies trading support principles and disciplines to the general class of commodity purchasing. A customer can refer to information shown in a trading monitor to make a trading decision. Thirdly, the module 330C provides an automated, standardized decision support methodology for non-traded commodities. Fourthly, the decision support module 330C provides real-time trends on commodities in a graphical format to commodity traders, thereby increasing the ability of commodity traders to quickly identify and react to trends.

The web-rendering module 330D of Fig. 3 provides two important functions. Firstly, using the XML data interchange constructs, formatted information is passed directly between the back-office system 310 and the back-office systems of customers and/or suppliers 350, 352. Secondly, information screens and forms are rendered in HTML format for users to rely on a traditional web-interface (i.e., locate an http web page and fill in blanks or review information screens).

Customers 350 and/or suppliers 352 can preferably access the system 310, 320, 330 through a traditional web browser via the Internet, an Intranet, an Extranet, or other like network 340; alternatively, this may be done through server to server data interchange using the XML standard. It is not necessary for customers 350 and/or suppliers 352 to have the same architecture as the virtual commodity exchange system 310, 320, 330 to access the system 310, 320, 330. As long as the computer system(s) of the customer/ supplier understands the XML language, the customer / supplier can either upload and/or download information through a web browser. Alternatively, the customer / supplier computer system can perform server to server level communication to interchange data. Information 360 can be passed between the customer / supplier system 350, 352 and the system 310, 320, 330 via the network 340.

Preferably, the customer system 350 has a front-end processing system 350A, a backend processing system 350B, and storage media 350C for storing data. Preferably, the supplier system 352 has a corresponding structure or arrangement. Alternatively, the customer and/or supplier systems 350, 352 can duplicate the structure of the system 310, 320, 330

in that party's environment, thereby enabling complete end-to-end communication through both organizations' purchasing systems. Front-end processing systems 350A typically include a web server to provide the "store front" portion of e-commerce or e-business systems, including electronic "catalogs", "shopping carts", user profiles, and other items that assist with purchasing. The back-end system 350B involves functionality including order entering, the creation of purchase orders, payment processing and the like. For example, the back-end system 350B may be connected to bank and other payment institutions for payment of user purchases. However, for business-to-business purchases, a 30-day account payment system may be used. Numerous payment schemes can be practiced without departing from the scope and spirit of the invention. In many existing systems, the front-end and back-end systems require proprietary or batch software to integrate the two.

Preferably, the back-office interface module 330A and web-rendering module 330D are implemented utilizing XML.

XML is a language standard developed for web documents to communicate information in a structured manner using a "data tag language". This structure enables web designers to create common tag "families" through which applications can exchange data. XML facilitates several key aspects of the virtual commodity-trading system. Firstly, XML provides the ability to extract meaningful (formatted) information from the World Wide Web (WWW). This data (along with data from other proprietary sources) populates an extensive, historical database, which drives the decision support module 330C. Secondly, XML provides the ability to exchange data between back-office and web server applications via a common pre-defined and platform-independent data interchange medium 320. Thirdly, XML provides the ability to perform "EDI-like" functionality across the Internet, Intranet, Extranet, or other like network 340 without the EDI infrastructure or support from a value added network (VAN) provider. Fourthly, XML provides the ability to establish integrated back-office to back-office connections through the Internet, Intranet, Extranet, or other like network 340 using a standard data model, independent of the associated hardware platforms, back-office operating systems, or back-office transaction processing systems.

Thus, the XML/EDI implementation used by the web server 330 integrates application systems among buyers and sellers. The XML language

defines the data in use for the web server 330. The definition of data may contain several parts. Each part is included within a pair of family name tags. The group of family name tags are stored in a Document Type Declaration (DTD) file to be used by application software during program execution. Table 1 provides an example of a DTD that can be used to practice the embodiments of the invention.

TABLE 1

```
<Entity type = "Customer">
      <Name type = "Company">
            Company A </Name>
      <Address>
            <Street> 123 E.34th Street </Street>
            <City> New York </City>
            <State> NY </State>
            <ZipCode>10016 </ZipCode>
      </Address>
</Entity>
```

The DTD of Table 1 defines an entity type for customers. The customer data includes the company name and address. An address is defined to have a Street, City, State and ZipCode.

XML defines the structure of data, but does not dictate any display media or format. The eXtensible Style Language (XSL) provides a mechanism for formatting and transforming XML data either at a browser or on a server. XSL allows a software application to take abstract data semantics of an XML instance and transform the abstract data semantics into a presentation language such as HTML for a web browser. To make data accessible and reusable for other applications, the format and layout of XML data is defined separately by an XSL style sheet. In this manner, data from one application can be used in another application by simply changing the XSL style sheet for displaying their own look and feel. With the combination of XML and XSL style sheet, data can be made independent of the application that produces the data. This is depicted in Fig. 6.

Fig. 6 is a block diagram of a trading center 650 and a single partner system 610, representative of the systems of customers and suppliers. The trading center 650 includes a web server 662 with an XML/XSL module 664, an XSL processor browser 660 for interfacing with the XML/XSL module 664, a data interchange module 666, and an SAP 668 with storage media 670. The partner system 610 includes a browser 620 with XSL processor, a web server 622 with an XML/XSL module similar to the trading center 650, a back-end system 624 with storage media 628, and an Enterprise Resource Planning (ERP) system 626. The ERP 626 may be an SAP and provides the following functionality: finance, human resources, sales, ordering, manufacturing, logistics and/or procurement applications. Information between partners 610 and the trading center 650 can be interchanged through the network seamlessly.

The data interchange module 666 located between the web server 662 and the SAP or back office system 668 transforms data in XML/XSL into a document format understood by the back office system 668. Preferably, the XML/XSL data is converted into Interface Document (IDOC) format where the back office system is implemented using an SAP (IDOC is proprietary to SAP). The back office system may however be implemented using other ERPs, which have their own requirements regarding document and data formats.

Many industry standard bodies have been working on specifications of XML and XSL. The XML and XSL language definition of the embodiments is flexible so as to adopt future standards. Preferably, the XML definition of the virtual commodity exchange follows the same standard as for EDI data definitions, which is well known and understood by those skilled in the art. More preferably, Lotus XSL is used to implement an XSL processor in Java and can interface to applications programs that conform to the Document Object Model (DOM) specification. Therefore, application software using data defined in XML and XSL is able to integrate with upstream and downstream applications without manual intervention.

V. Functional Modules of Virtual Commodity Exchange

The four architectural modules 330A-330D shown in Fig. 3 for the virtual commodity exchange or virtual trading system can be linked together in a variety of configurations to accomplish any of the four general classes of trading (i.e., captive, private, public, and re-sale). Fig. 4 illustrates details of a Component Trading Model 400 in accordance

with a first embodiment of the invention, which can be used to address component buy / sell transactions in any of the four general classes. The trading model or trading entity 400 has three key components: a web site or server 410, a data interchange module 450, and a back-end office 460, the latter being preferably an SAP system. The trading model 400 is capable of communicating with both customer systems (or customer entities) 470, 472, 474 and supplier systems (or supplier entity) 480, 482, 484, preferably by means of the Internet, an Intranet, an Extranet, or other appropriate network 490, 492 (represented symbolically by vertical bars).

In general terms, the trading entity 400 can receive a sale order for the commodity from a customer entity 470-474 via a network 490 using a data interchange medium, which preferably includes the XML language. The trading entity 400 sources a supplier entity of the commodity from supplier entities 480-484 via the network 492 dependent upon information made available on the network 490, 492 to the trading entity 400 using the data interchange medium. Using XML, the trading entity 400 commits a commodity purchase transaction via the network 492 to the supplier entity 480-484. Using XML, the trading entity 400 commits a commodity sale transaction via the network 490 to the customer entity. These aspects of the trading model 400 are described in further detail hereinafter.

The customer system 470 includes a front-end module 470A, a back-end module 470B, and storage media 470C and is representative of other customer systems 472, 474. Correspondingly, supplier system 480 includes a front-end module 480A, a back-end module 480B, and storage media 480C and is representative of other supplier systems 482, 484. As shown in Fig. 4, the data interchange module 450 is capable of communications amongst the web site 410, back-end office system 460, customer systems 470, 472, 474, and supplier systems 480, 482, 484.

The web site or server 410 has storage media 412 (e.g. a hard disk drive, CD-ROM, electronic memory, and the like) and includes the following functional modules: a price monitoring module 410A, a price masking module 410B, a price-catalog module 410C, a tracking module 410D, and an XML module 410E. The price-monitoring module 410A provides continuous monitoring of product prices in the market place with trend, range and best buy recommendations and is implemented using the decision support module 330C of the web server 330. Further, the price-monitoring module 410A carries out the following functions: 1) product information is

collected to create a commodity database by integrating several information sources, 2) the commodity database is analyzed to provide a purchase recommendation, and 3) information about a commodity(ies) is displayed for reference by a monitoring alert (described below) or on demand. The price mask module 410B facilitates buy and sell transactions with a certain percentage of markup for profits preferably. However, this module is optional. Other pricing techniques may be implemented without departing from the scope and spirit of the invention. For example, a fixed service charge might be charged rather a percentage. The price-mask module 410B is implemented using the query engine 330B of the web server 330 and utilizes a buyer's profile to determine the final price.

The price or product catalog 410C collects a list of products available for trading with detailed descriptions and is also implemented using the query engine 330B. This permits a customer to search for a product and provides a product description. The tracking module 410D allows requests from a customer system to query the trading center system 400 for the current status of a transaction and is implemented using the query engine 330B. The XML (buy / sell transaction) module 410E performs the core operations for buying and selling products using XML technology and is implemented using the back-office interface module 330A and the web-rendering module 330D. The XML module 410E applies XML / XSL standards for information storage and display.

Monitoring alerts 420 may be provided as previously described. A typical buy / sell transaction involves the following sequence of events:

1) RFI / RFQ 430 (between Customer 470-474 and web site 410)
2) Sales Order 432 (from Customer 470-474 to web site 410)
3) Order Alert 434 (from web site 410 to Supplier 480-484)
4) Price Quote 436 (from Supplier 480-484 to web site 410)
5) Purchase Order 438 (from web site to Supplier 480-484)
6) Status Track 440 (from Customer 470-474 to web site 410)
7) Invoice 442 (from Supplier 480-484 to web site 410)
8) Invoice 444 (from web site 410 to Customer 470-474)
9) Payment 446 (from web site 410 to Supplier 480-484)
10) Payment 448 (from Customer 470-474 to web site 410).

The customer RFI/RFQ 430 is made via XML data exchange. The RFI/RFQ 430 is provided to the XML module 410E of the web site 410. There are two

approaches for data interchange depending on the preference and capability of a customer or supplier. As long as the customer's / supplier's system 470, 480 is able to understand the predefined XML language format (family tags), the customer / supplier can perform the data interchange with the trading center by: 1) using any web browser to access the web site 410 and select an upload or download option, or 2) from the computer system of the customer / supplier 470, 480 directly connecting to the web server 410 or data interchange server 450 (optional) to interchange data. For the second approach, server-to-server level data interchange depends on the system configuration of the customer / supplier. In this manner, a customer 470-474 can request a component price quote (e.g., a price quote for electronic memory components). The query engine module 330B formats the request and communicates via the XML module 410E to the back-office system (preferably, the back office interface module 330A of Fig. 3 is implemented using XML). The back-office system 460 formats and returns the requested data to the customer 470-474 via a web page or performs a direct XML data transfer.

The sales order 432 is based on a successful RFI 430. The customer electronically places a purchase order to the web server 410. The order is formatted and loaded into the back office transaction processing system 460 and an automatic confirmation notice, with a tracking number, is returned to the customer system 470-474.

An order alert 434 utilizes the decision support module 330C, so that the system 410 queries all possible sources 480-484 to obtain price quotes 436. Based on the price quotes 436 from the suppliers 480-484, the system 410 informs a trader of a preferred option for this order. The trader confirms the decision. An order is automatically created in the back-office system and transmitted to the supplier 480-484 utilizing XML.

The supplier 480-484 receives the order request and confirms price and delivery by a price quote 436 sent to the web server 410. This can be completely automated if the supplier 480-484 has implemented server to server level integration with the web site 410 instead of accessing through a web browser from the network.

Based on confirmation of the terms of the price quote 436, the trader utilizing the web server 410 electronically requests and receives confirmation of approval to commit funds for the purchase. The back

office system 460 issues a formal purchase order 438, which is electronically transmitted to the supplier 480-484.

Using the confirmation number of the sales order 432, the customer 470-474 can query (status track 440) the web site 410 to track the status of the order at any point in the process. The query 440 is received by the query engine 330B of the web server 410, formatted for the back office system 460, and transmitted via XML 410E. The resulting information about the status of the sales order 432 is returned to the customer 470-474 by the same interface. Again, if the customer 470-474 has implemented the server-to-server level integration and already has the pricing information, the sales order 432 can be passed from the customer back office system 470-474 to the trading center server 410. Note that the data interchange module 450 is optional. The trading center implementation assumes a web server to perform the integration for data interchange. For security reasons, customers / suppliers are not allowed to access the back end system 460 directly. In this way, the customer back-office system 470B-474B can establish "trigger events" within the customer's system 470-474 that initiate automatic system-to-system information exchange.

When the purchase order 438 to the supplier 480-484 has been filled, the supplier 480-484 automatically generates an invoice (request for payment) 442. The web server 410 accepts the invoice 442 via XML 410E and transmits the invoice 410 to the back-office system 460.

Upon receipt of the supplier invoice 442 indicating confirmation of order fulfillment, the back-office system 460 generates an invoice 444 to the customer. The invoice 444 is transmitted via XML 410E from the back-end system 460 through the web server 410 to the customer 470-474.

Upon confirmation of order completion, a finance support team of the Trading Center 400 authorizes supplier payment 446 (electronic or paper, depending upon financial controls for the particular supplier 480-484) based on the requirements of the business control process. An electronic acknowledgement is sent from the back-office system 460 through the web-server 410 to the supplier 480-484. A similar set of events for a customer payment 448 are triggered to complete the financial transaction between the trading center 400 and the customer 470-474.

The embodiments of the invention are preferably implemented using general-purpose computers. In particular, the processing or functionality of Figs. 1-7 can be implemented as software, or a computer program, executing on a computer. The method or process steps of a virtual commodity-trading system capable of automating the entire purchasing life cycle are effected by instructions in the software that are carried out by the computer. The software may be implemented as one or more modules for implementing the process steps. A module is a part of a computer program that usually performs a particular function or related functions. Also, as described hereinbefore, a module can also be a packaged functional hardware unit for use with other components or modules.

In particular, the software may be stored in a computer usable or readable medium, including a floppy disc, a hard disc drive, a magneto-optical disc drive, CD-ROM, magnetic tape or any other of a number of non-volatile storage devices well known to those skilled in the art. The software is preferably loaded into the computer from the computer usable medium and then carried out by the computer. A computer program product includes a computer usable medium having such software or a computer program recorded on the medium that can be carried out by a computer. The use of the computer program product in the computer preferably effects an advantageous system for virtual commodity trading.

The computer system can be connected to one or more other computers via a communication interface using an appropriate communication channel such as a modem communications path, a computer network, or the like. The computer network may include a local area network (LAN), a wide area network (WAN), an Intranet, an Extranet, and/or the Internet.

Numerous configurations of computer systems can be employed without departing from the scope and spirit of the invention. Computers with which the embodiment can be practiced include IBM-PC/ATs or compatibles, the Macintosh (TM) family of PCs, Sun Sparcstation (TM), a workstation or the like. The foregoing is merely exemplary of the types of computers with which the embodiments of the invention may be practiced.

Typically, the processes of the embodiments are resident as software or a program recorded on a hard disk drive as the computer readable medium, and read and controlled using the computer system. In some instances, the program may be supplied to the user encoded on a CD-ROM or

a floppy disk, or alternatively could be read by the user from the network via a modem device connected to the computer, for example. Still further, the software can also be loaded into the computer system from other computer readable medium including magnetic tape, a ROM or integrated circuit, a magneto-optical disk, a radio or infra-red transmission channel between the computer and another device, a computer readable card such as a PCMCIA card, and the Internet, Intranets, Extranets, and other like networks including email transmissions and information recorded on web sites and the like. The foregoing is merely exemplary of relevant computer readable mediums. Other computer readable mediums may be practiced without departing from the scope and spirit of the invention.

Thus, a virtual commodity-trading model and system for implementing the same capable of automating the entire purchasing life cycle are disclosed. In particular, a method, apparatus, computer program product, and system for virtual commodity trading are disclosed.

CLAIMS

1. A method of virtual trading of a commodity between business entities using one or more networks, said method including the steps of:

receiving via a network at a trading entity a sale order for said commodity from a customer entity using a data interchange medium;

sourcing via said network by said trading entity a supplier entity of said commodity from a plurality of supplier entities dependent upon information made available on said network to said trading entity using said data interchange medium;

committing a purchase transaction of said commodity via said network from said trading entity to said supplier entity using said data interchange medium; and

committing a sale transaction of said commodity via said network from said trading entity to said customer entity using said data interchange medium.

2. The method according to claim 1, wherein said network is a computer network selected from the group consisting of the Internet, an Intranet and an Extranet.

3. The method according to claim 1, wherein said data interchange medium is selected from the group consisting of:

the eXtensible Markup Language (XML),

XML and the eXtensible Style Language (XSL), and

the eXtensible Markup Language / Electronic Data Interchange (XML/EDI).

4. The method according to claim 1, wherein said customer entity and each of said supplier entities include a front end processing system, a back end processing system, and storage media.

5. The method according to claim 1, wherein said trading entity includes a web server, a back-end processing system, and storage media, wherein said data interchange medium interfaces between said web server and said back-end processing system.

6. The method according to claim 1, further including the step of automatically monitoring by said trading entity information about said commodity from one or more sources via said network using said data interchange medium.

7. The method according to claim 6, further including the step of generating by said trading entity a commodity database containing information about said commodity derived from said one or more sources using said data interchange medium.

8. The method according to claim 7, further including the step of analyzing said commodity database to recommend said supplier entity as said source of said commodity from amongst said plurality of supplier entities.

9. The method according to claim 7, further including the step of generating a monitoring alert at said trading entity dependent upon said commodity database.

10. The method according to claim 1, further including the step of tracking the status of said sale order in response to a query of said customer entity via said data interchange medium.

11. The method according to claim 1, wherein said sourcing step further includes the step of issuing an order alert from said trading entity to said plurality of supplier entities via said network using said data interchange medium to solicit said information about said commodity from said plurality of supplier entities.

12. The method according to claim 11, wherein said sourcing step includes the steps of:

issuing a monitor alert by the trading entity recommending said supplier entity dependent upon said information about said commodity; and

selecting said supplier entity to source said commodity in response to user input at said trading entity.

13. The method according to claim 1, wherein said purchase transaction committing step further includes the step of sending a purchase order from said trading entity to said supplier entity sourcing said commodity via said network using said data interchange medium.

14. The method according to claim 13, wherein said purchase transaction committing step further includes the step of issuing a confirmation of order fulfillment from said supplier entity to said trading entity via said network using said data interchange medium in response to said purchase order from said trading entity.

15. The method according to claim 14, wherein said purchase transaction committing step further includes the step of effecting payment from said trading entity to said supplier entity in response to said confirmation of order fulfillment.

16. The method according to claim 1, wherein said sale transaction committing step further includes the step of issuing a confirmation of order fulfillment from said trading entity to said customer entity via said network using said data interchange medium.

17. The method according to claim 16, wherein said sale transaction committing step further includes the step of receiving payment at said trading entity from said customer entity in response to said confirmation of order fulfillment.

18. The method according to claim 1, further including the step of providing a catalog of said commodity by said trading entity via said network.

19. An apparatus for virtual trading of a commodity between business entities using one or more networks, said apparatus including:

means for receiving via a network at a trading entity a sale order for said commodity from a customer entity using a data interchange medium;

means for sourcing via said network by said trading entity a supplier entity of said commodity from a plurality of supplier entities dependent upon information made available on said network to said trading entity using said data interchange medium;

means for committing a purchase transaction of said commodity via said network from said trading entity to said supplier entity using said data interchange medium; and

means for committing a sale transaction of said commodity via said network from said trading entity to said customer entity using said data interchange medium.

20. A computer program product having a computer usable medium having a computer readable program code means embodied therein for virtual trading of a commodity between business entities using one or more networks, said computer program product including:

computer readable program code means performing the steps of the method of any claim 1 to 18.

21. A method for trading commodities using a network, said method including the steps of:

automatically extracting information about a commodity from remote sources via said network using a data interchange medium;

deriving information about said commodity for a transaction based on said extracted information; and

providing said derived information about said commodity to enable said transaction regarding said commodity.

22. An apparatus for trading commodities using a network, said apparatus including:

means for automatically extracting information about a commodity from remote sources via said network using a data interchange medium;

decision support means for deriving information about said commodity for a transaction based on said extracted information;

means for providing said derived information about said commodity to enable said transaction regarding said commodity.

23. A computer program product having a computer usable medium having a computer readable program code means embodied therein for trading commodities using a network, said computer program product including:

computer readable program code means for performing the steps of claim 21.

24. A method of trading a commodity via one or more networks, said method including the steps of:

providing a web server accessible to said one or more networks, said web server utilizing a data interchange medium for mapping data between said web server and a back office transaction system, said web server also being capable of extracting information about a commodity from remote sources via said network using said data interchange medium and deriving information about said commodity based on said extracted information;

receiving a sales order for said commodity from a customer via said network using said data interchange medium;

issuing an order alert to one or more suppliers of said commodity via said network using said data interchange medium;

receiving one or more price quotes from at least one of said suppliers, respectively, via said network using said data interchange medium;

selecting a supplier from said suppliers based on said one or more price quotes and derived information about said commodity;

placing a purchase order for said commodity to said selected supplier via said network using said data interchange medium;

receiving confirmation of said purchase order being accepted by said selected supplier via said network using said data interchange medium;

placing a confirmation of order fulfillment for said commodity to said customer via said network using said data interchange medium; and

receiving acknowledgement of acceptance by said customer via said network using said data interchange medium.

25. An apparatus of trading a commodity via one or more networks, said apparatus including:

a web server accessible to said one or more networks, said web server utilizing a data interchange medium for mapping data between said web server and a back office transaction system, said web server having means for extracting information about a commodity from remote sources via said network using said data interchange medium and means for deriving information about said commodity based on said extracted information;

means for receiving a sales order for said commodity from a customer via said network using said data interchange medium;

means for issuing an order alert to one or more suppliers of said commodity via said network using said data interchange medium;

means for receiving one or more price quotes from at least one of said suppliers, respectively, via said network using said data interchange medium;

means for selecting a supplier from said suppliers based on said one or more price quotes and derived information about said commodity;

means for placing a purchase order for said commodity to said selected supplier via said network using said data interchange medium;

means for receiving confirmation of said purchase order being accepted by said selected supplier via said network using said data interchange medium;

means for placing a confirmation of order fulfillment for said commodity to said customer via said network using said data interchange medium; and

means for receiving acknowledgement of acceptance by said customer via said network using said data interchange medium.

26. A computer program product having a computer usable medium having a computer readable program code means embodied therein for trading a commodity via one or more networks, said computer program product including:

computer readable program code means for performing the steps of claim 24.

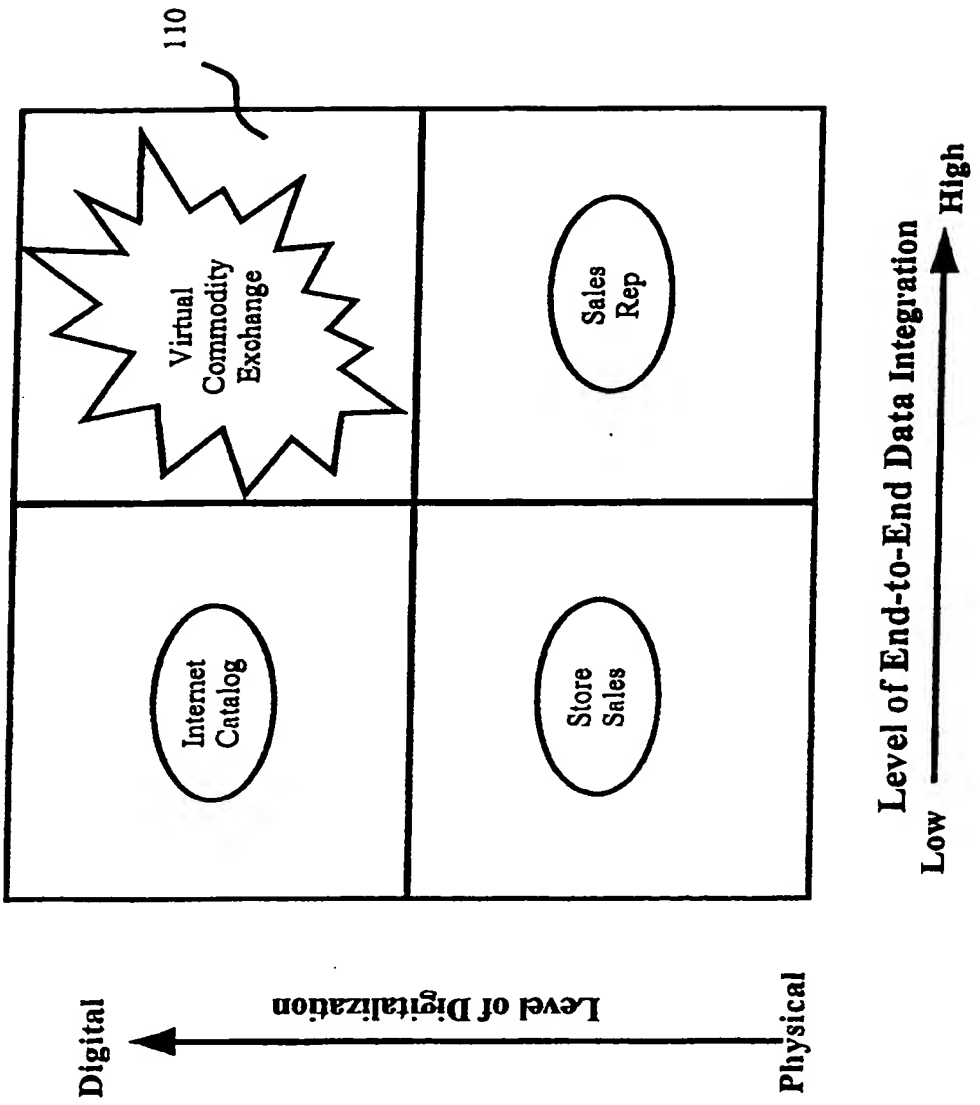
110
Virtual Commodity Exchange
Sales Rep
Internet Catalog
Store Sales
Digital
Level of Digitalization
Physical
Low
Level of End-to-End Data Integration
High

FIG. 1

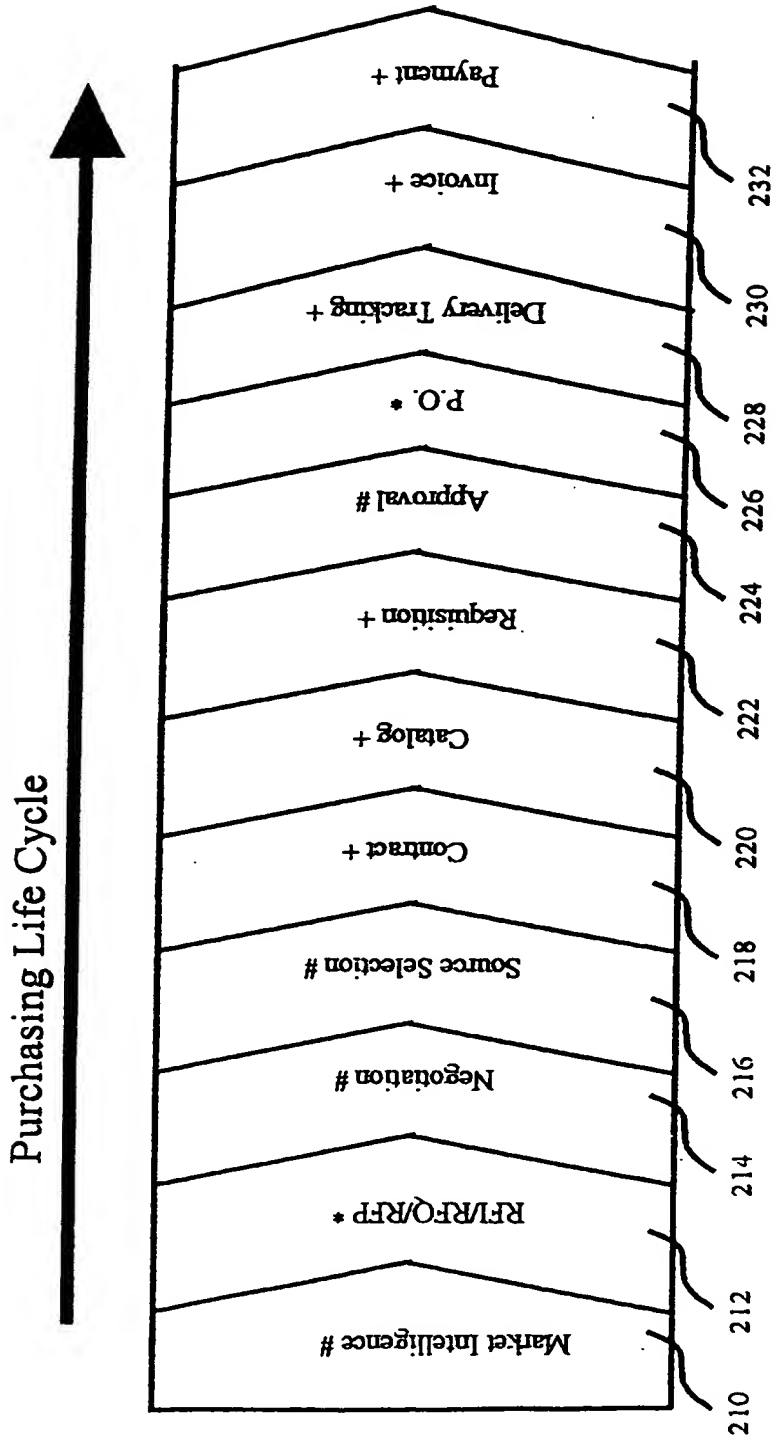
Purchasing Life Cycle
Market Intelligence #
RFI/RFQ/RFP *
Negotiation #
Source Selection #
Contract +
Catalog +
Requisition +
Approval #
P.O. *
Delivery Tracking +
Invoice +
Payment +
210
212
214
216
218
220
222
224
226
228
230
232

FIG. 2

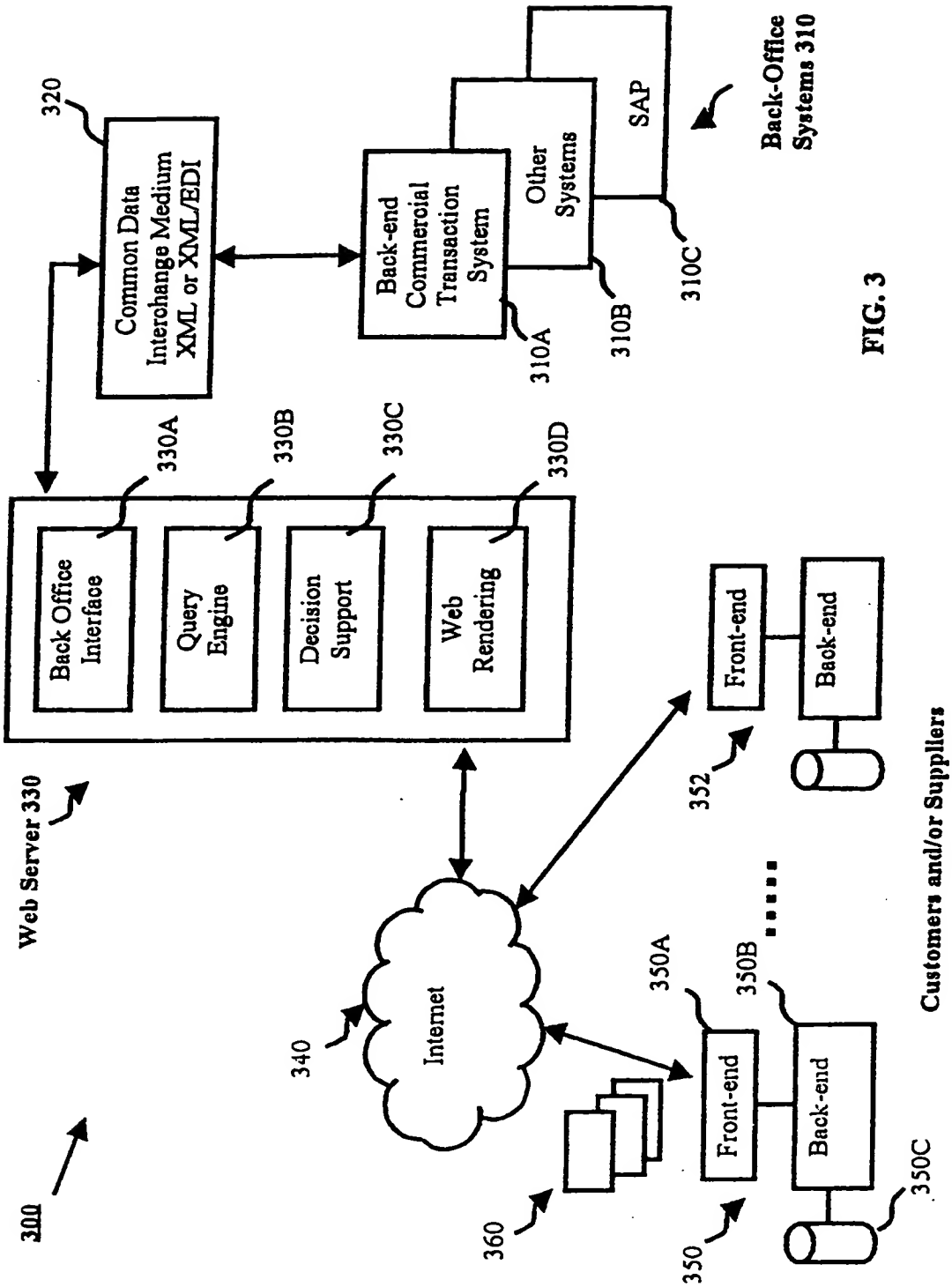
300
Web Server 330
Back Office Interface
Query Engine
Decision Support
Web Rendering
330A
330B
330C
330D
320
Common Data Interchange Medium XML or XML/EDI
Back-end Commercial Transaction System
Other Systems
SAP
310A
310B
310C
Back-Office Systems 310
340
Internet
360
350
Front-end
Back-end
350A
350B
350C
352
Front-end
Back-end
Customers and/or Suppliers

FIG. 3

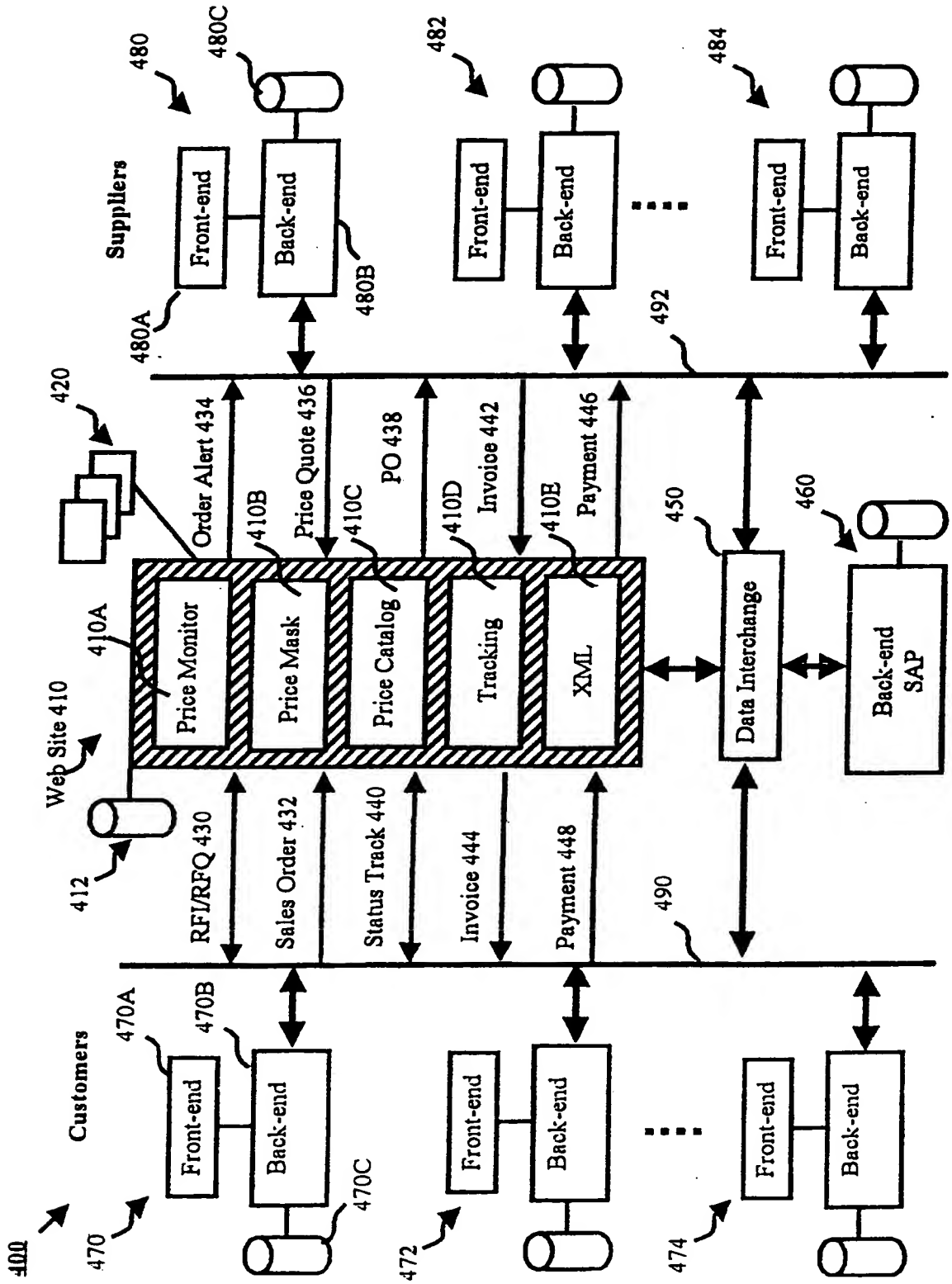
400
Customers
470
470A
Front-end
470B
Back-end
470C
472
474
Suppliers
480
480A
480B
480C
482
484
492
490
Web Site 410
412
410A
Price Monitor
Price Mask
Price Catalog
Tracking
XML
410B
410C
410D
410E
420
Order Alert 434
Price Quote 436
PO 438
Invoice 442
Payment 446
RFI/RFQ 430
Sales Order 432
Status Track 440
Invoice 444
Payment 448
450
Data Interchange
460
Back-end SAP

FIG. 4

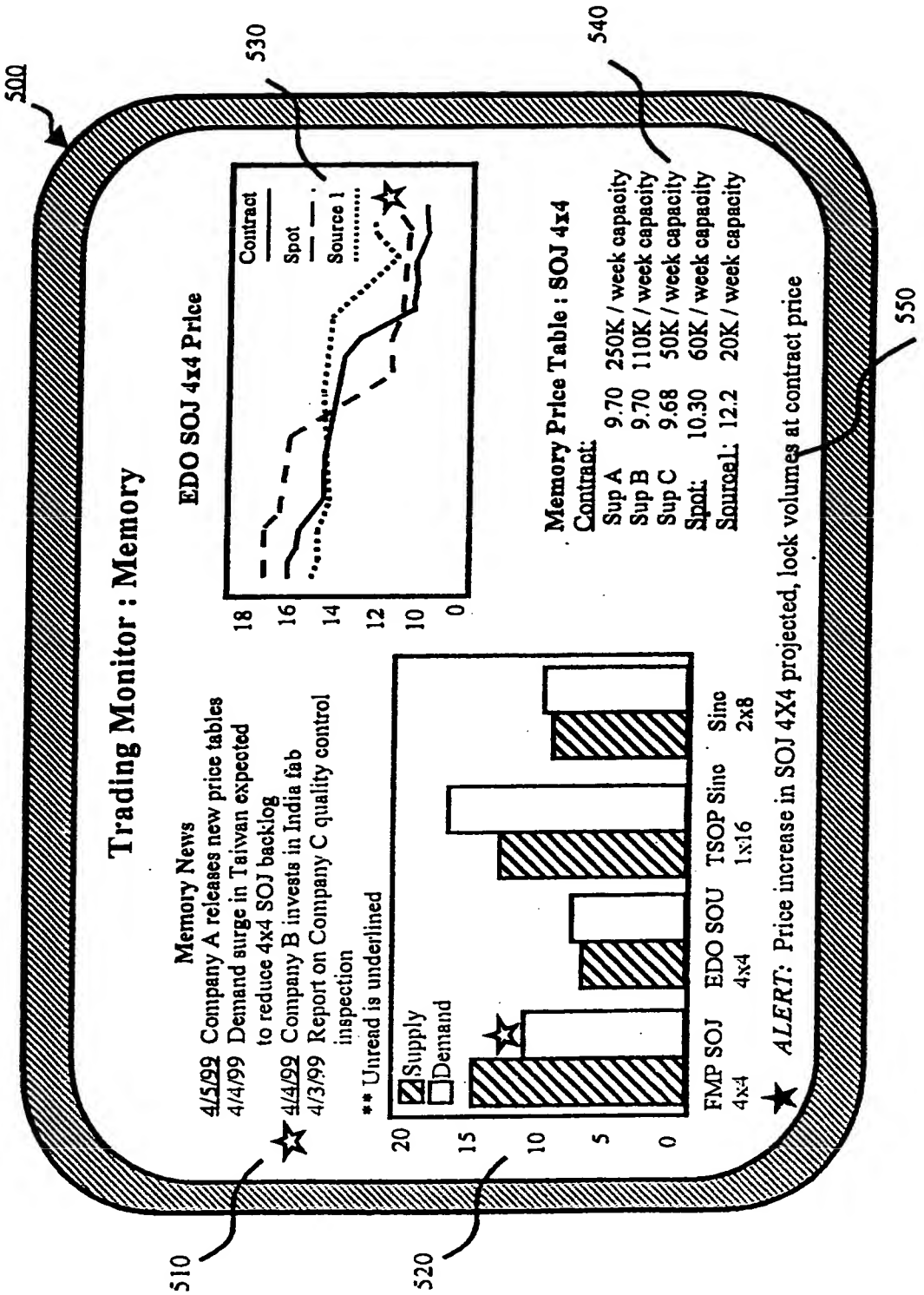
500
510
520
530
540
550
Trading Monitor : Memory
Memory News
4/5/99 Company A releases new price tables
4/4/99 Demand surge in Taiwan expected to reduce 4x4 SOJ backlog
4/4/99 Company B invests in India fab
4/3/99 Report on Company C quality control inspection
** Unread is underlined
EDO SOJ 4x4 Price
Contract
Spot
Source 1
18
16
14
12
10
0
Supply
Demand
20
15
10
5
0
FMP SOJ 4x4
EDO SOJ 4x4
TSOP 1x16
Sino
Sino 2x8
ALERT: Price increase in SOJ 4X4 projected, lock volumes at contract price
Memory Price Table : SOJ 4x4
Contract:
Sup A 9.70 250K / week capacity
Sup B 9.70 110K / week capacity
Sup C 9.68 50K / week capacity
Spot: 10.30 60K / week capacity
Source1: 12.2 20K / week capacity

FIG. 5

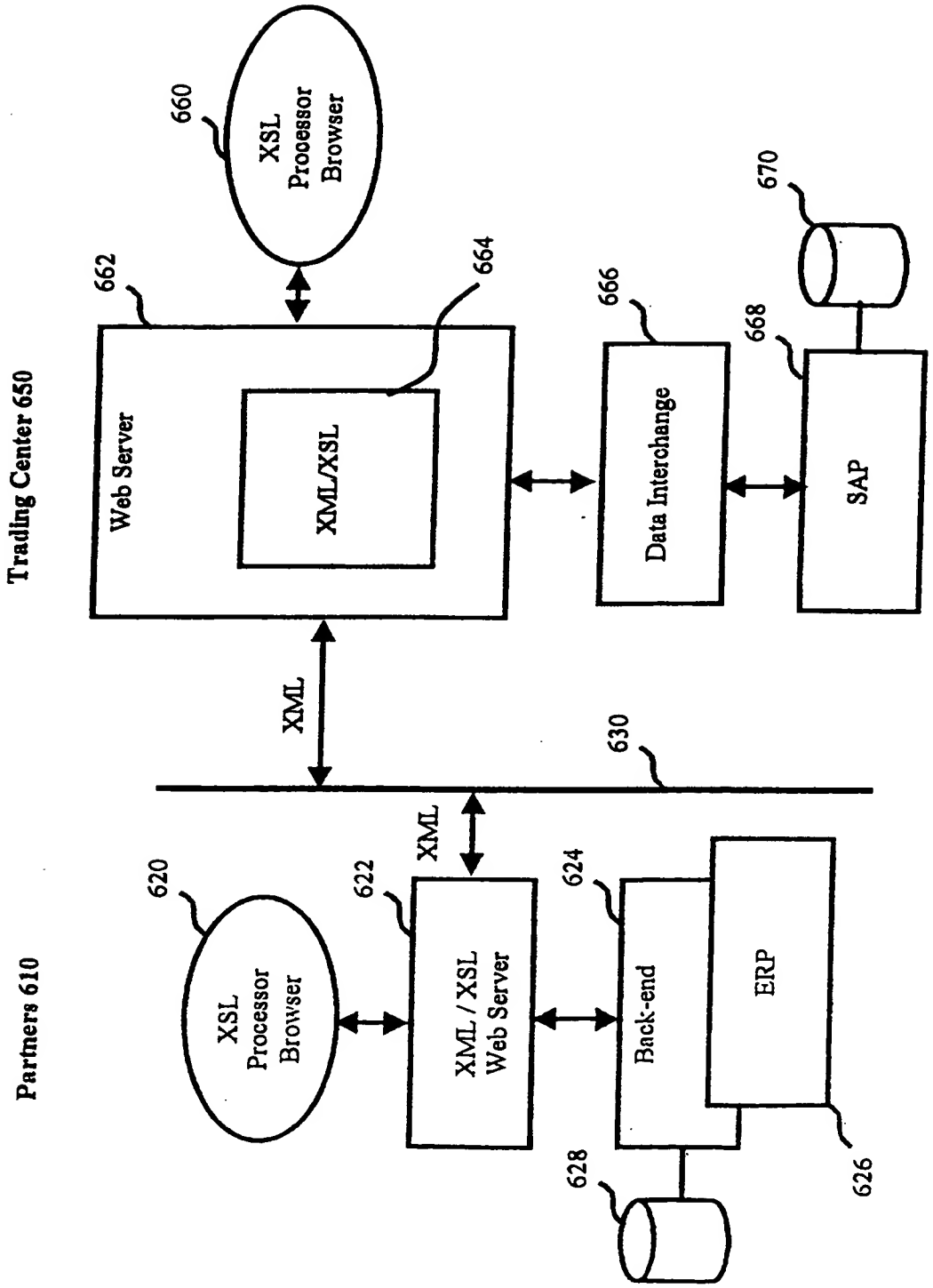
Trading Center 650
Partners 610
660
XSL Processor Browser
662
Web Server
664
XML/XSL
666
Data Interchange
668
SAP
670
XML
630
620
XSL Processor Browser
622
XML / XSL Web Server
624
Back-end
ERP
626
628

FIG. 6

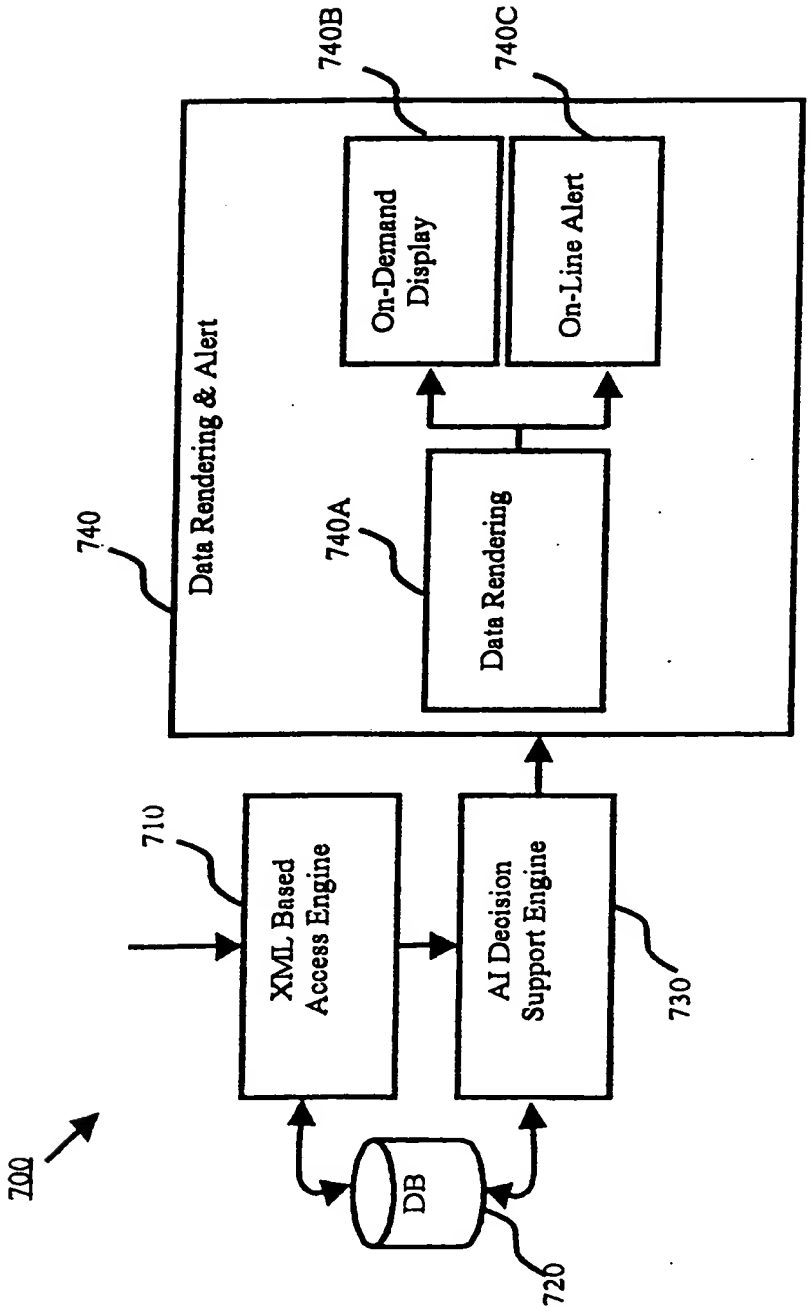
700
710
XML Based Access Engine
DB
720
AI Decision Support Engine
730
740
Data Rendering & Alert
740A
Data Rendering
740B
On-Demand Display
740C
On-Line Alert

FIG. 7